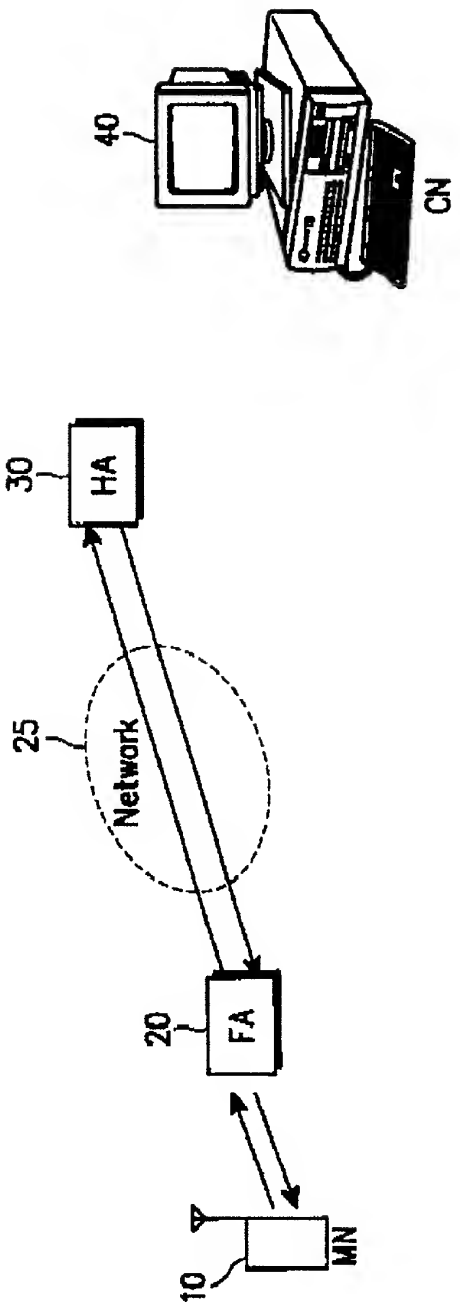

FIG. 1

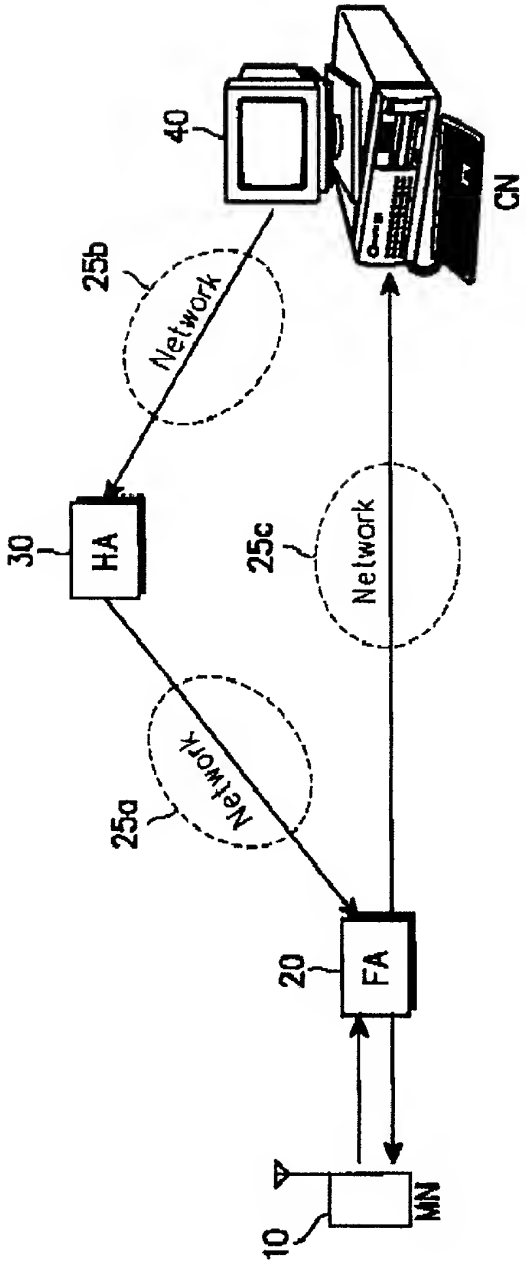

FIG. 2

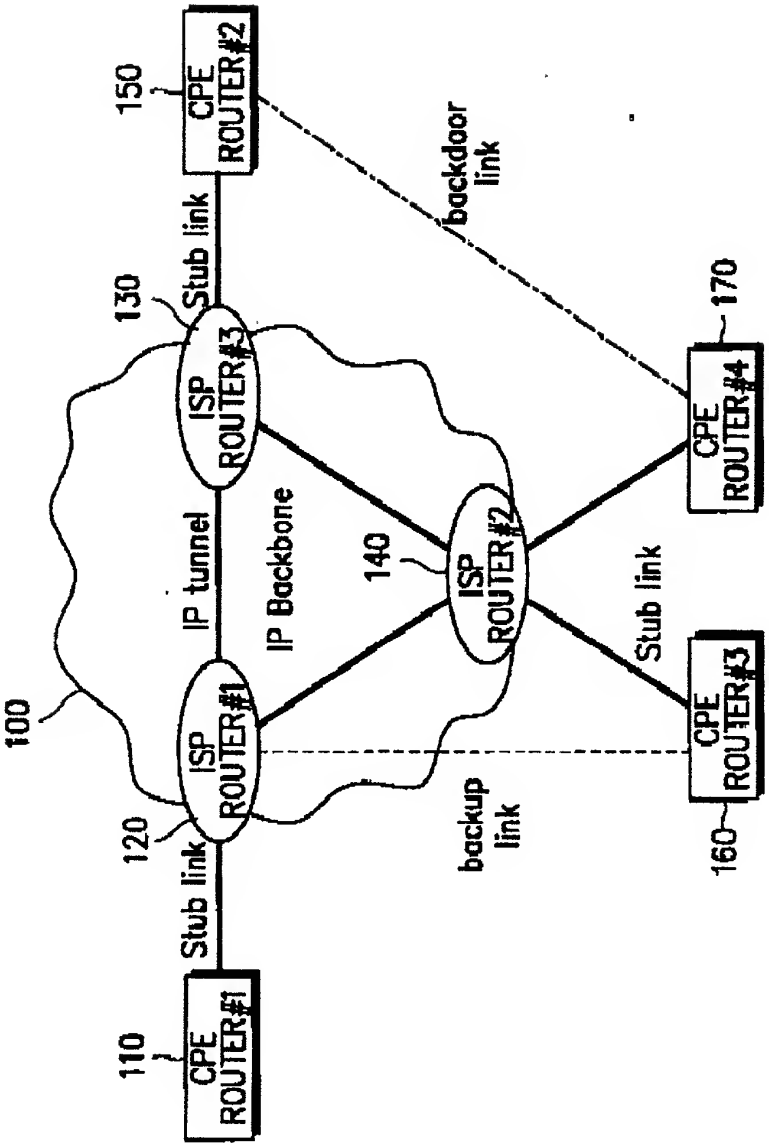
100
ISP ROUTER#1
ISP ROUTER#3
ISP ROUTER#2
IP tunnel
IP Backbone
140
Stub link
Stub link
Stub link
backup link
backdoor link
CPE ROUTER#1
CPE ROUTER#2
CPE ROUTER#3
CPE ROUTER#4
110
120
130
150
160
170

FIG. 3

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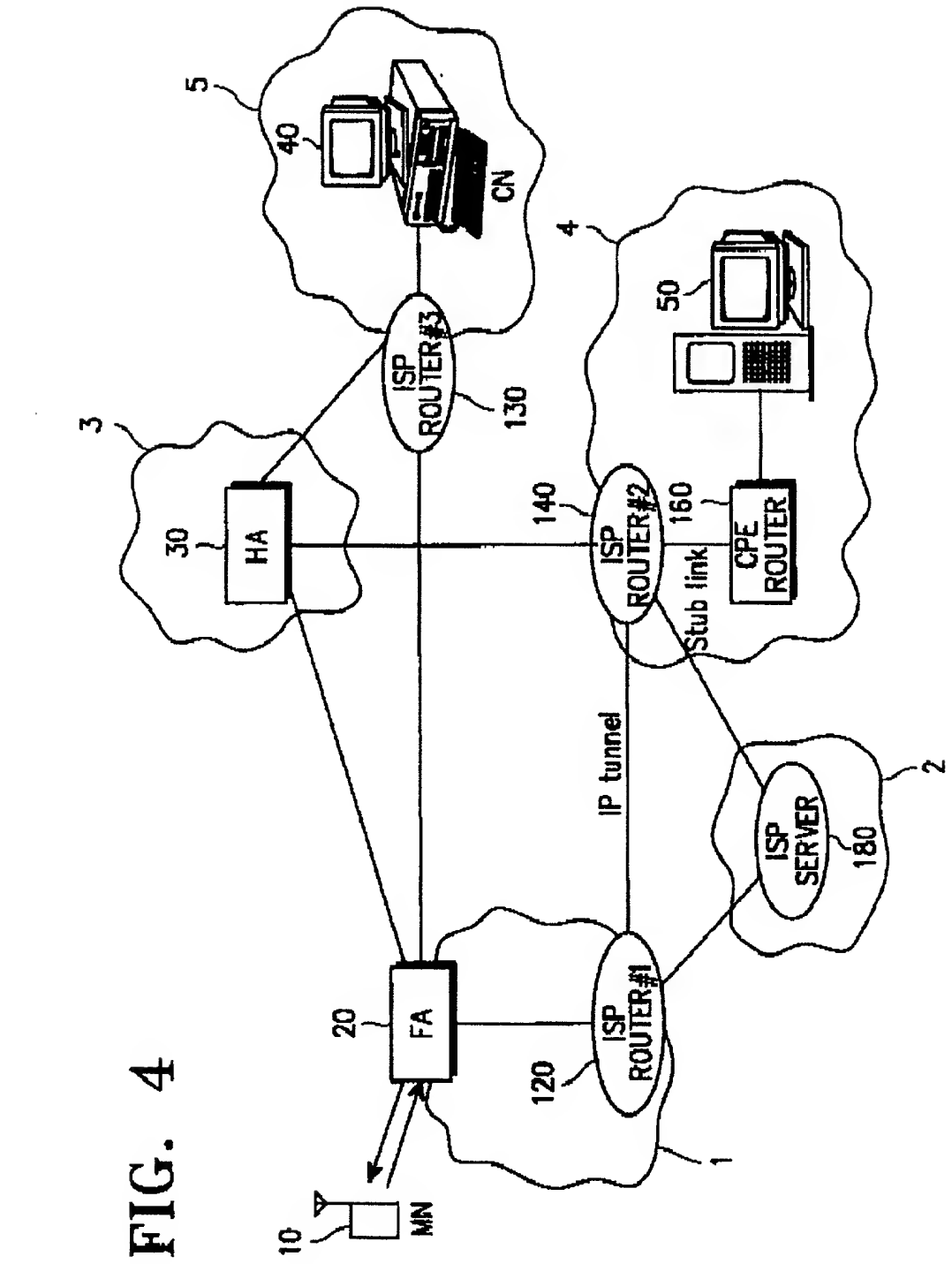
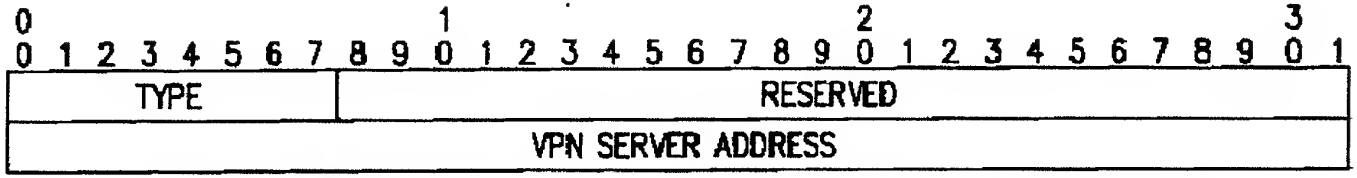
FIG. 4

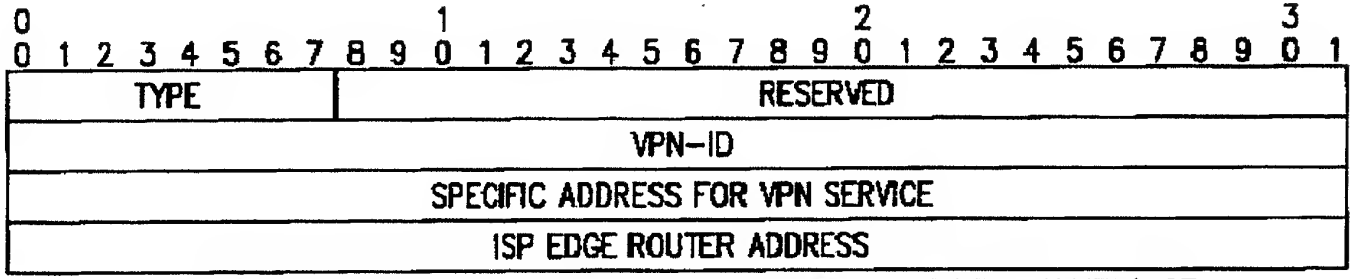


EOTOFF*hES20001



NEW EXTENSION FOR VPN SERVICE, USED IN REGISTRATION REQUEST MESSAGE

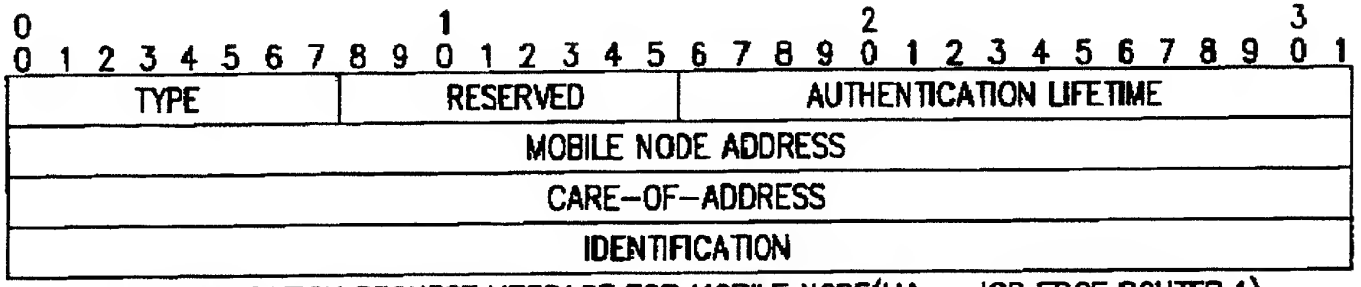
FIG. 5



NEW EXTENSION FOR VPN SERVICE, USED IN REGISTRATION REPLY MESSAGE

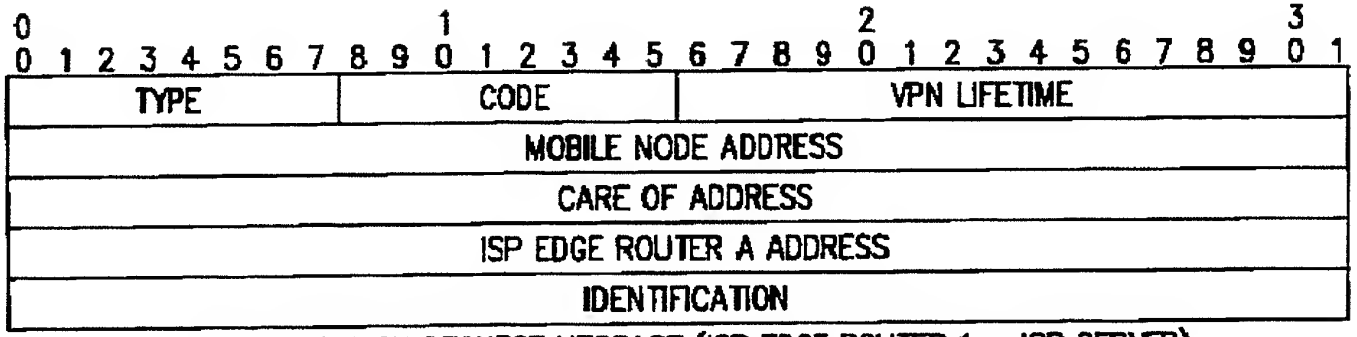
FIG. 6

TOTOFF"hES20000F



AUTHENTICATION REQUEST MESSAGE FOR MOBILE NODE(HA→ISP EDGE ROUTER 1)

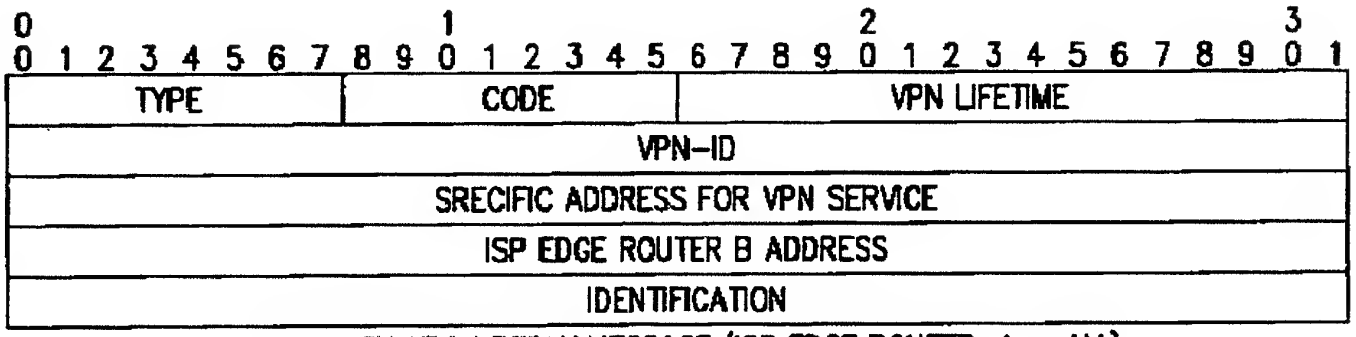
FIG. 7



AUTHENTICATION REQUEST MESSAGE (ISP EDGE ROUTER 1→ISP SERVER)

FIG. 8

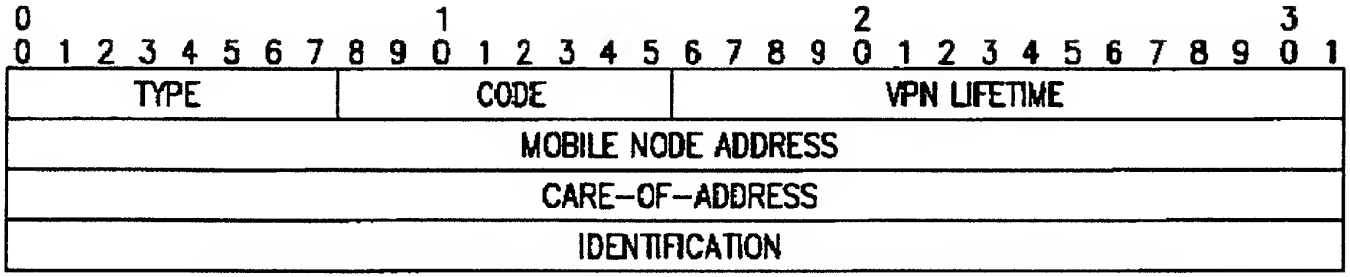
TOTOTT"hES20001



AUTHENTICATION REPLY MESSAGE (ISP EDGE ROUTER 1→HA)

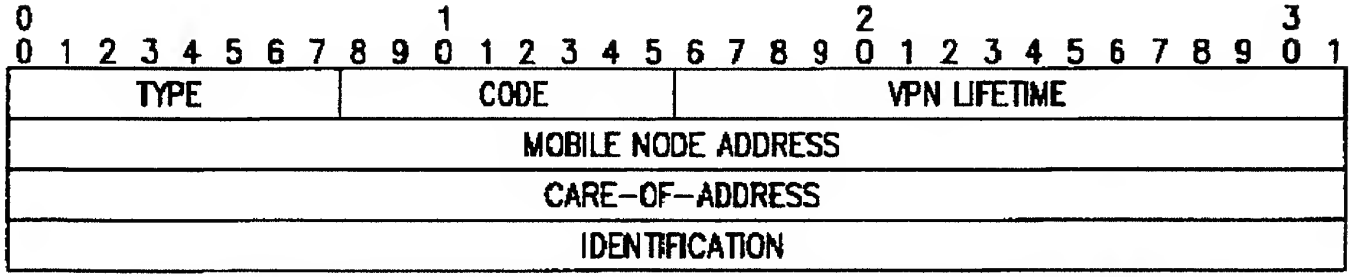
FIG. 9

TOTOTF"hES20000T



AUTHENTICATION REPLY MESSAGE (ISP SERVER → ISP EDGE ROUTER 1)

FIG. 10



AUTHENTICATION REPLY MESSAGE (ISP EDGE ROUTER 2 → ISP EDGE ROUTER 1)

FIG. 11

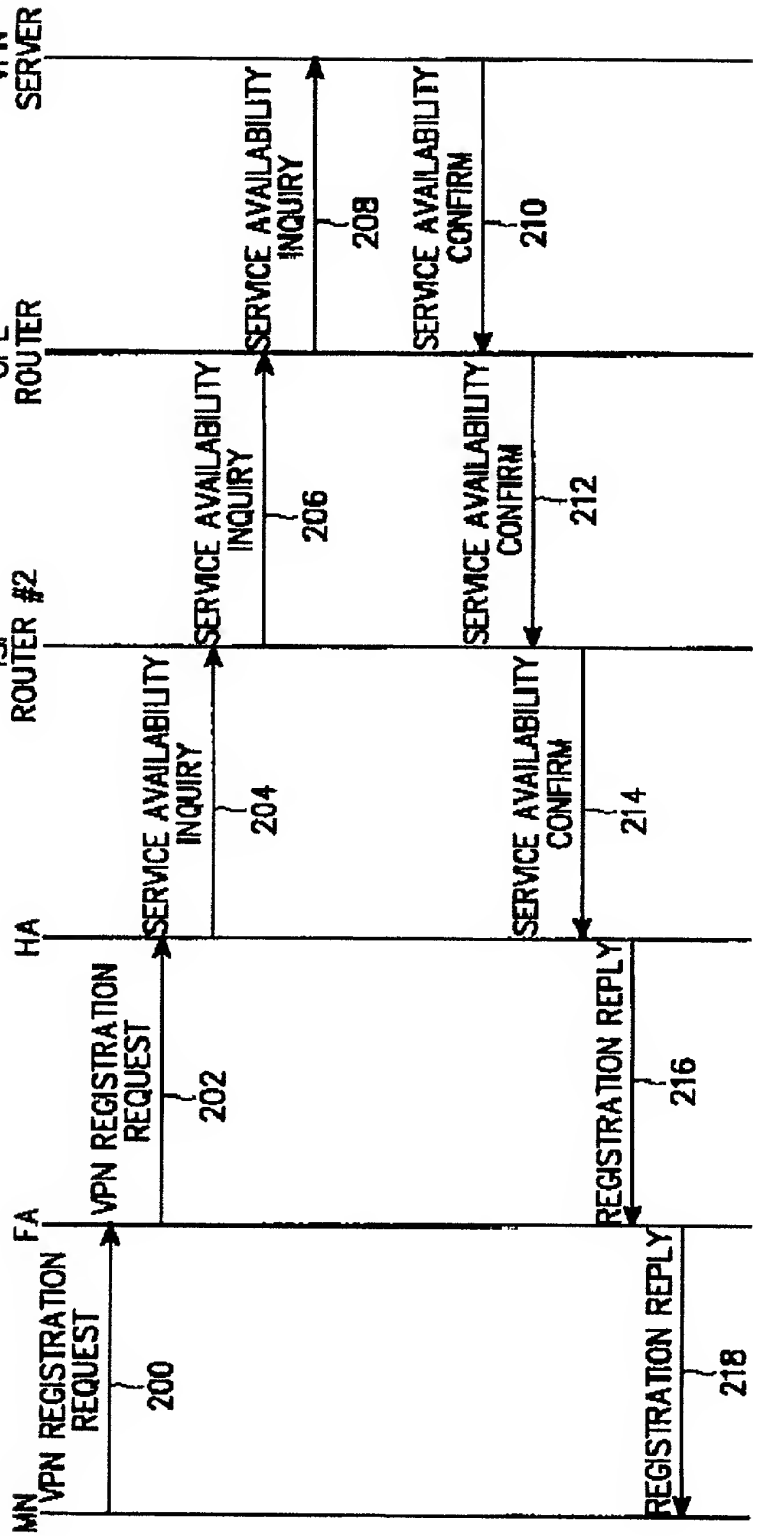

MN
FA
HA
ISP ROUTER #2
CPE ROUTER
VPN SERVER
VPN REGISTRATION REQUEST
200
VPN REGISTRATION REQUEST
202
SERVICE AVAILABILITY INQUIRY
204
SERVICE AVAILABILITY INQUIRY
206
SERVICE AVAILABILITY INQUIRY
208
SERVICE AVAILABILITY CONFIRM
210
SERVICE AVAILABILITY CONFIRM
212
SERVICE AVAILABILITY CONFIRM
214
REGISTRATION REPLY
216
REGISTRATION REPLY
218

FIG. 12

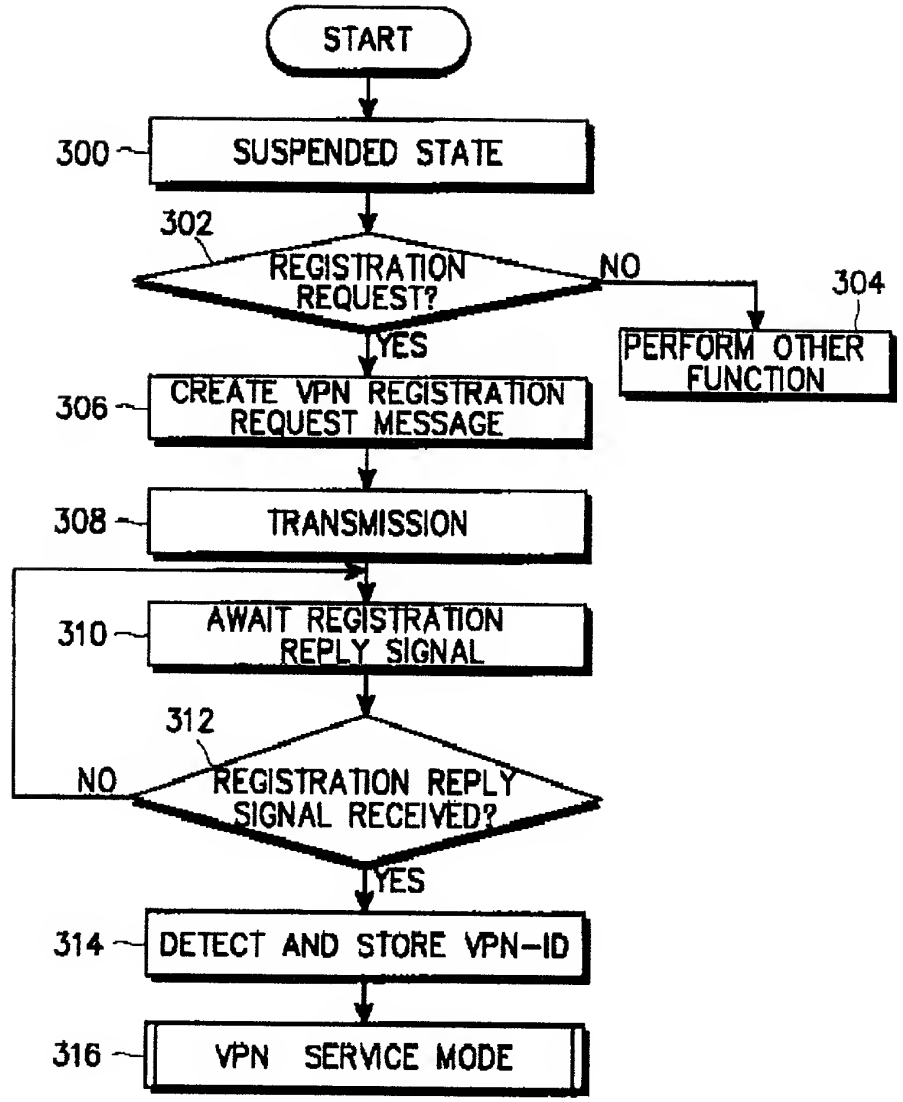

START
300
SUSPENDED STATE
302
REGISTRATION REQUEST?
NO
304
PERFORM OTHER FUNCTION
YES
306
CREATE VPN REGISTRATION REQUEST MESSAGE
308
TRANSMISSION
310
AWAIT REGISTRATION REPLY SIGNAL
312
NO
REGISTRATION REPLY SIGNAL RECEIVED?
YES
314
DETECT AND STORE VPN-ID
316
VPN SERVICE MODE

FIG. 13

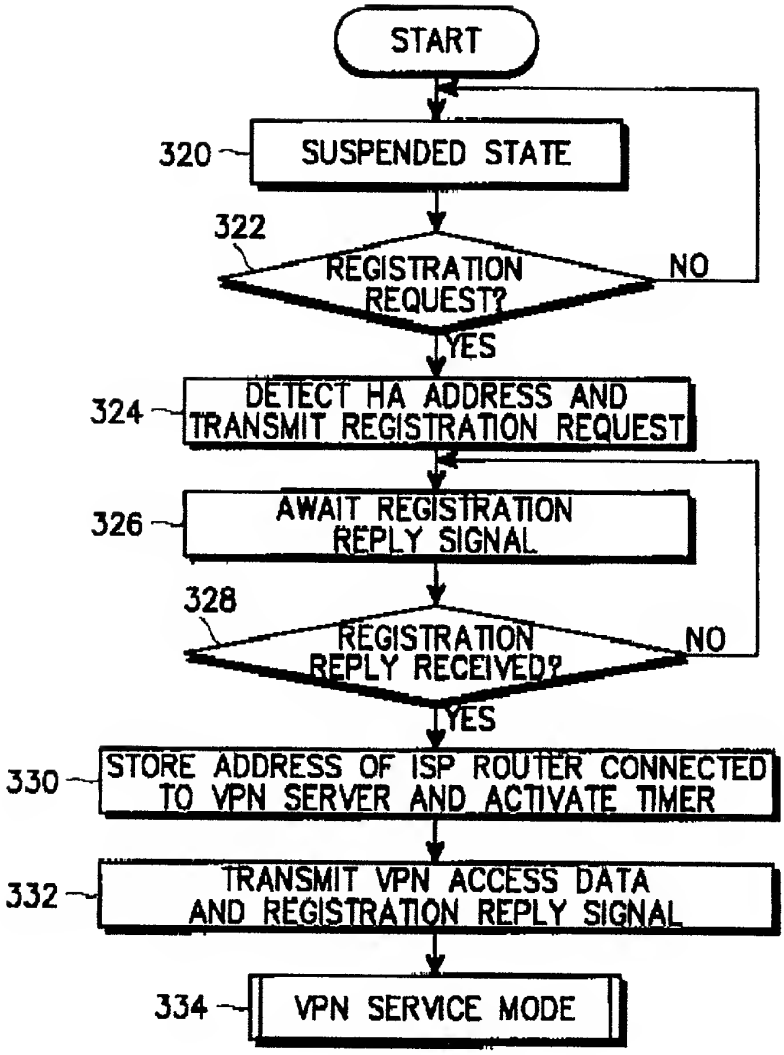

START
320
SUSPENDED STATE
322
REGISTRATION REQUEST?
NO
YES
324
DETECT HA ADDRESS AND TRANSMIT REGISTRATION REQUEST
326
AWAIT REGISTRATION REPLY SIGNAL
328
REGISTRATION REPLY RECEIVED?
NO
YES
330
STORE ADDRESS OF ISP ROUTER CONNECTED TO VPN SERVER AND ACTIVATE TIMER
332
TRANSMIT VPN ACCESS DATA AND REGISTRATION REPLY SIGNAL
334
VPN SERVICE MODE

FIG. 14

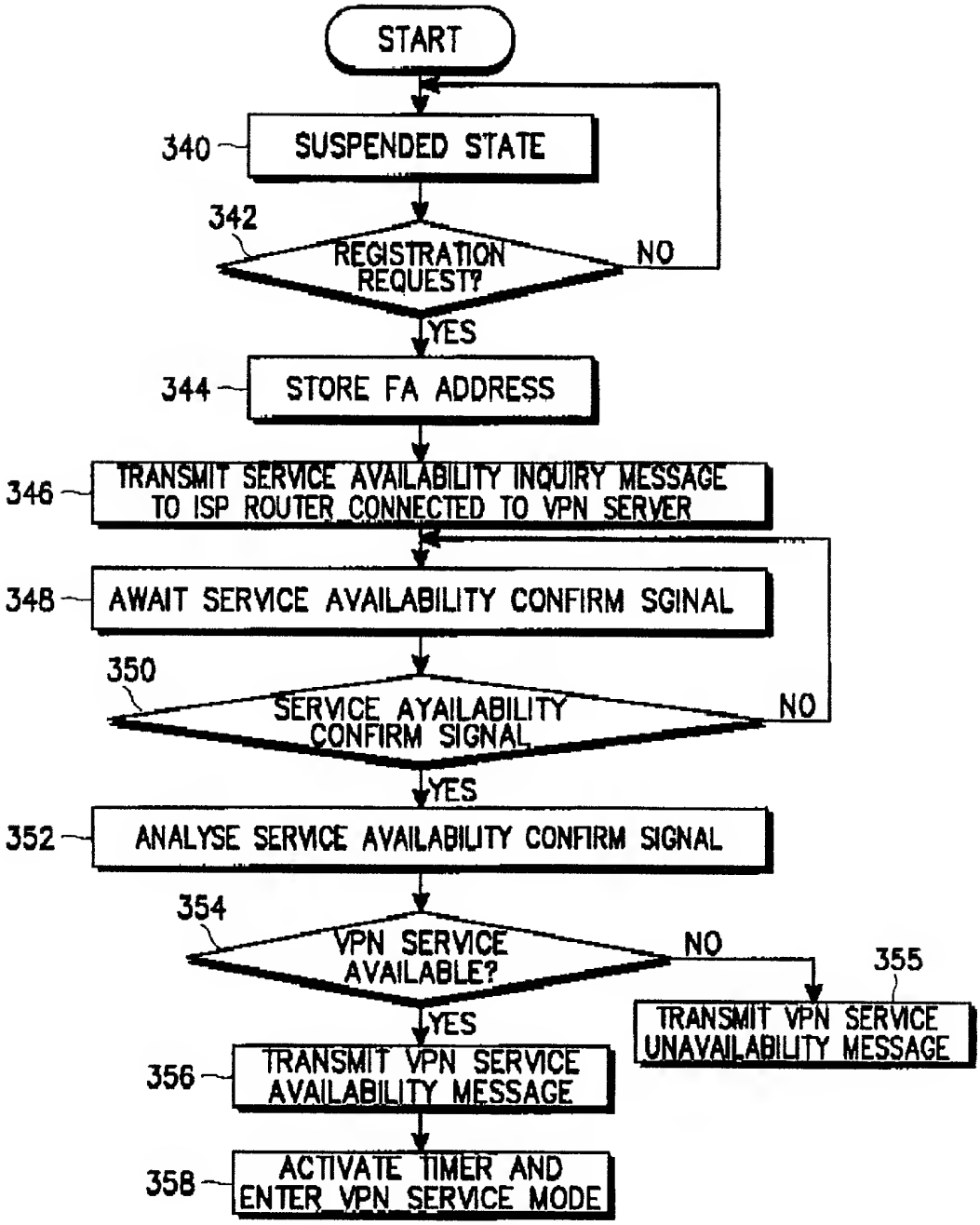

START
340
SUSPENDED STATE
342
REGISTRATION REQUEST?
NO
YES
344
STORE FA ADDRESS
346
TRANSMIT SERVICE AVAILABILITY INQUIRY MESSAGE TO ISP ROUTER CONNECTED TO VPN SERVER
348
AWAIT SERVICE AVAILABILITY CONFIRM SGINAL
350
SERVICE AYAILABILITY CONFIRM SIGNAL
NO
YES
352
ANALYSE SERVICE AVAILABILITY CONFIRM SIGNAL
354
VPN SERVICE AVAILABLE?
NO
355
TRANSMIT VPN SERVICE UNAVAILABILITY MESSAGE
YES
356
TRANSMIT VPN SERVICE AVAILABILITY MESSAGE
358
ACTIVATE TIMER AND ENTER VPN SERVICE MODE

FIG. 15

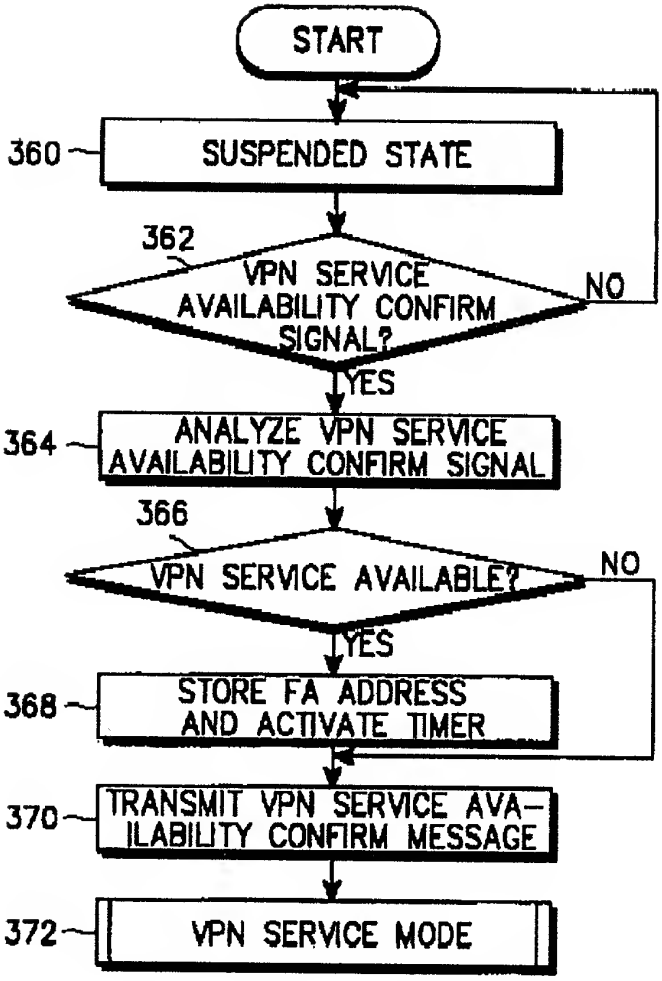
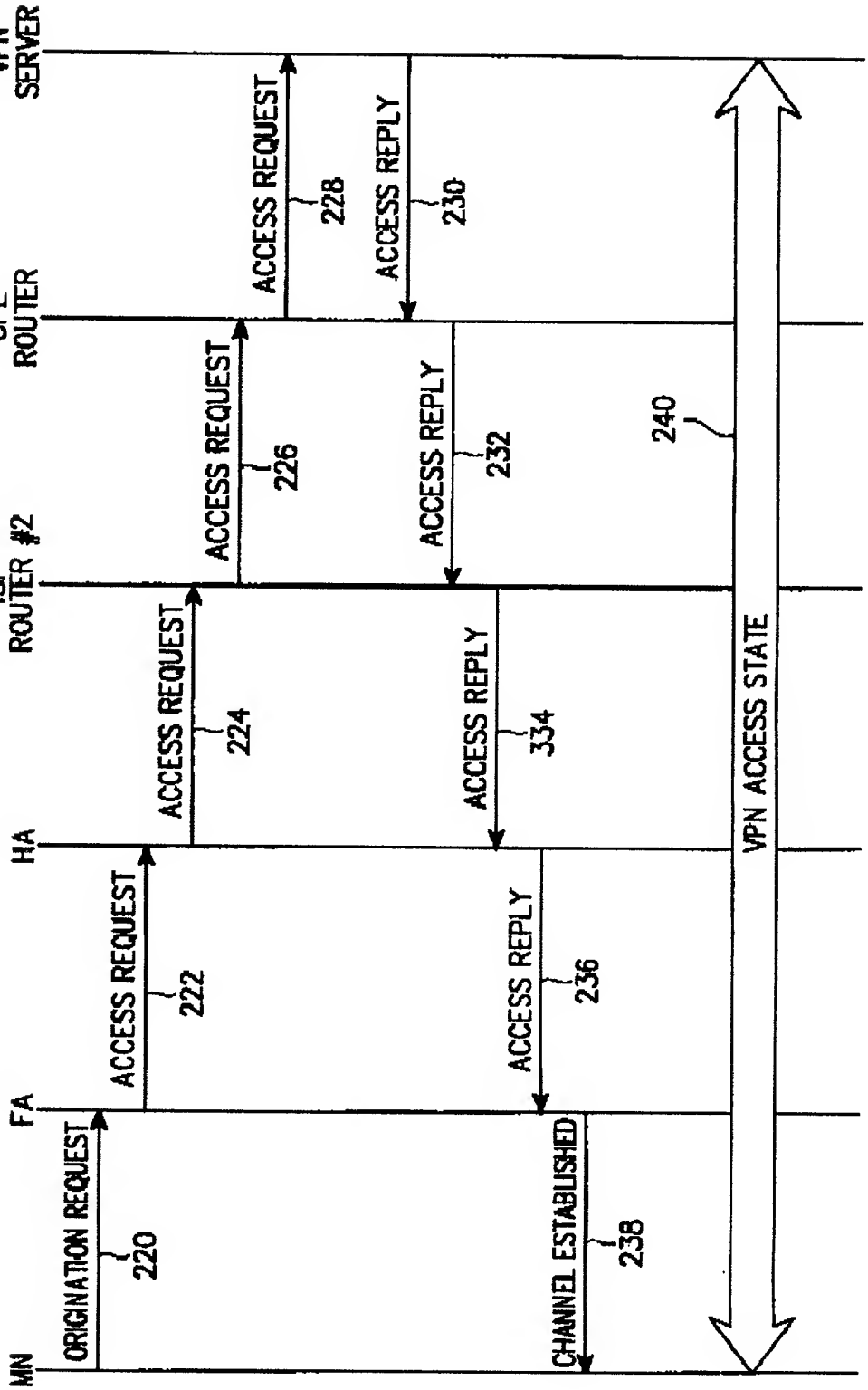

START
360
SUSPENDED STATE
362
VPN SERVICE AVAILABILITY CONFIRM SIGNAL?
NO
YES
364
ANALYZE VPN SERVICE AVAILABILITY CONFIRM SIGNAL
366
VPN SERVICE AVAILABLE?
NO
YES
368
STORE FA ADDRESS AND ACTIVATE TIMER
370
TRANSMIT VPN SERVICE AVAILABILITY CONFIRM MESSAGE
372
VPN SERVICE MODE

FIG. 16

FIG. 17


MN
FA
HA
ISP ROUTER #2
CPE ROUTER
VPN SERVER
ORIGINATION REQUEST
220
ACCESS REQUEST
222
ACCESS REQUEST
224
ACCESS REQUEST
226
ACCESS REQUEST
228
ACCESS REPLY
230
ACCESS REPLY
232
ACCESS REPLY
334
ACCESS REPLY
236
CHANNEL ESTABLISHED
238
240
VPN ACCESS STATE

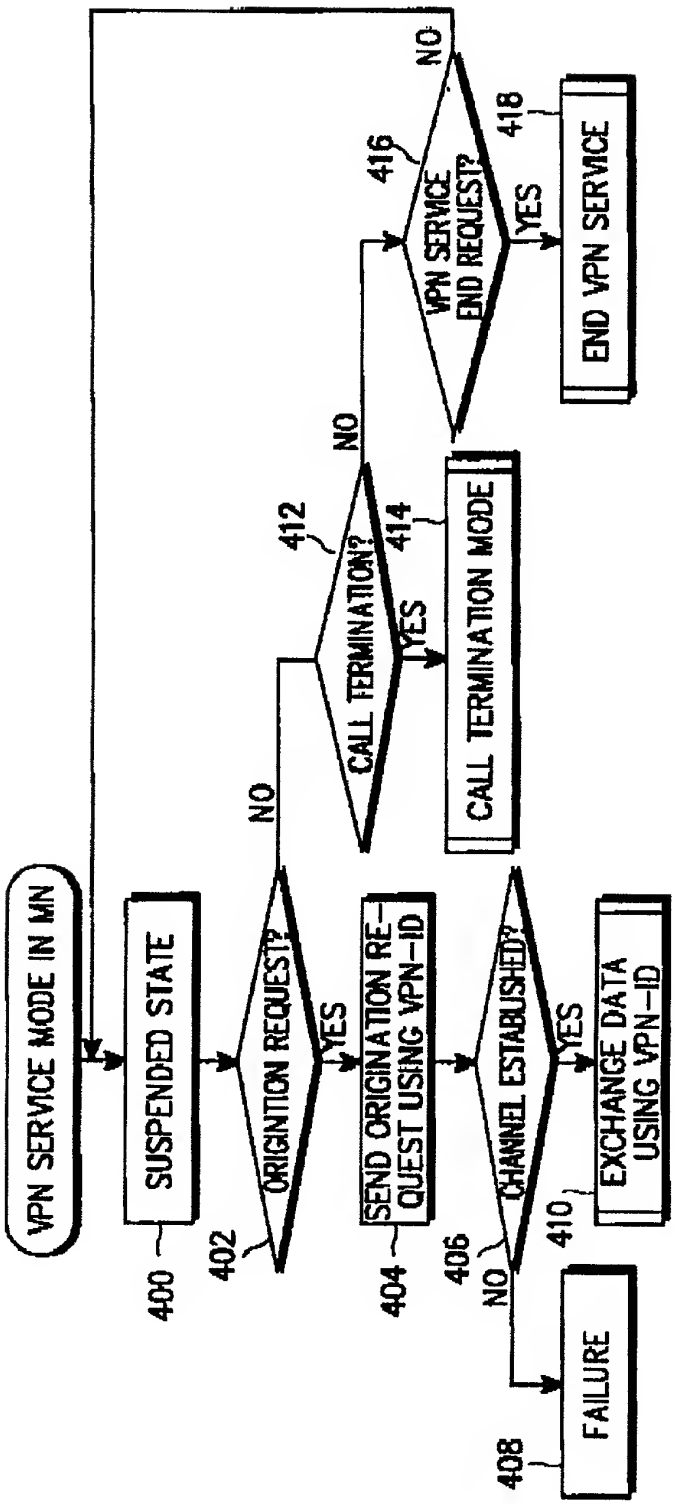

VPN SERVICE MODE IN MN
400
SUSPENDED STATE
402
ORIGINTION REQUEST?
NO
YES
404
SEND ORIGINATION REQUEST USING VPN-ID
406
CHANNEL ESTABLISHED?
NO
YES
408
FAILURE
410
EXCHANGE DATA USING VPN-ID
412
CALL TERMINATION?
NO
YES
414
CALL TERMINATION MODE
416
VPN SERVICE END REQUEST?
NO
YES
418
END VPN SERVICE

FIG. 18

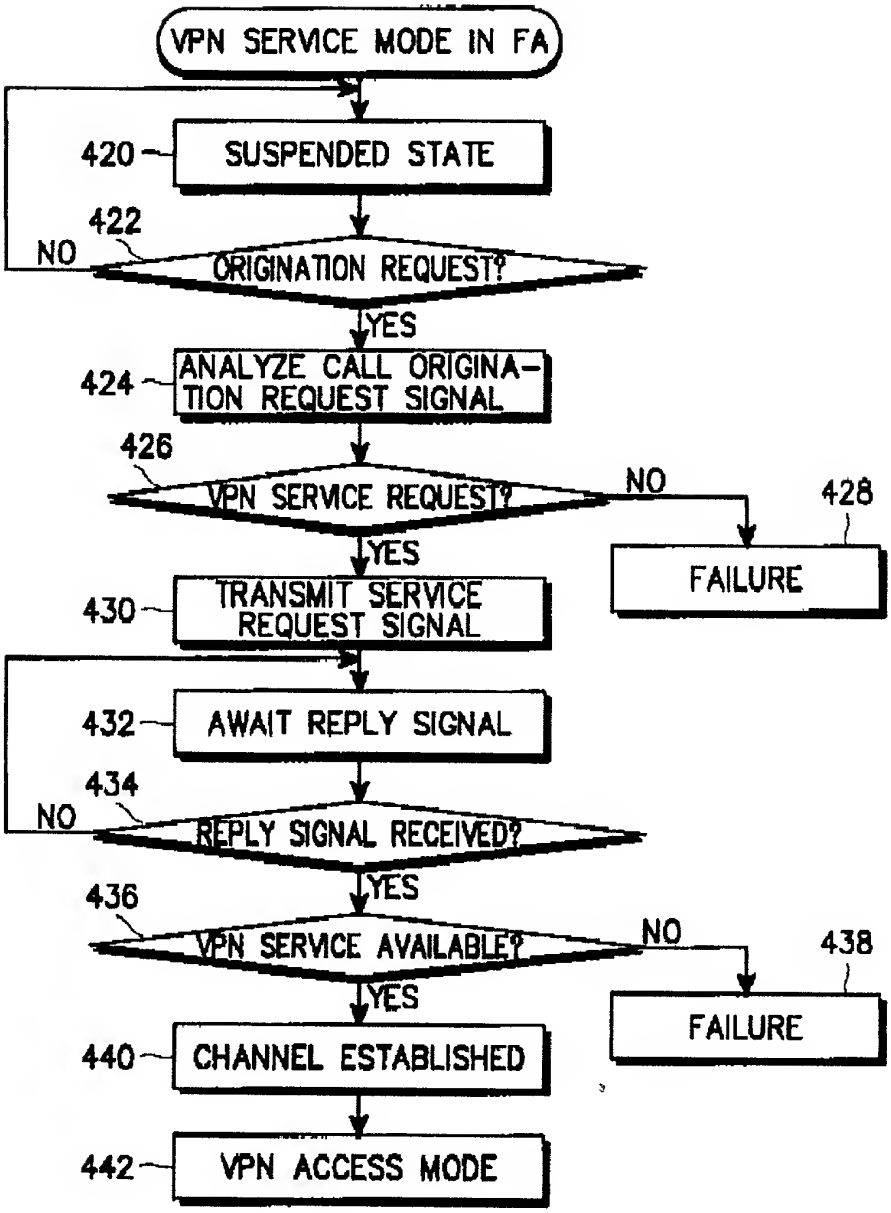

VPN SERVICE MODE IN FA
420
SUSPENDED STATE
422
NO
ORIGINATION REQUEST?
YES
424
ANALYZE CALL ORIGINATION REQUEST SIGNAL
426
VPN SERVICE REQUEST?
NO
428
FAILURE
YES
430
TRANSMIT SERVICE REQUEST SIGNAL
432
AWAIT REPLY SIGNAL
434
NO
REPLY SIGNAL RECEIVED?
YES
436
VPN SERVICE AVAILABLE?
NO
438
FAILURE
YES
440
CHANNEL ESTABLISHED
442
VPN ACCESS MODE

FIG. 19

EPOFORM: PCT/ISA/210

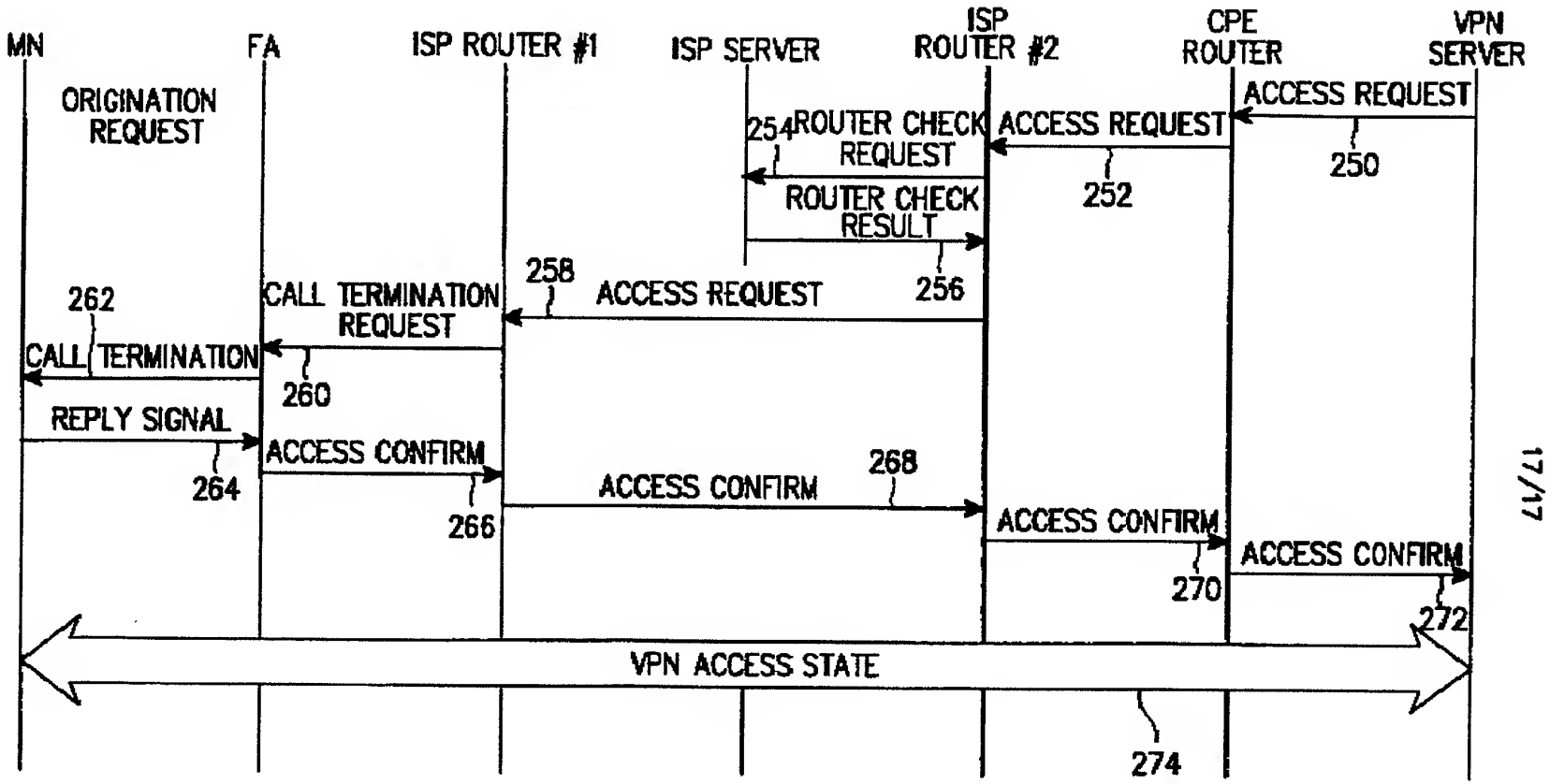


FIG. 20